

CLAIMS:

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1. A pressure transducer test apparatus comprising:
a fitting having an input to receive a pressure input and an output to receive a pressure transducer; and
a valve attached to the fitting near the input, such that the fitting has a variable pressure chamber with first and second selectable internal volumes between the valve and the output.
2. The pressure transducer test apparatus of claim 1 further comprising a piston provided in the fitting, such that movement of the piston selects the first and second volumes.
3. The pressure transducer test apparatus of claim 2 wherein the piston is moved in response to an electro magnet.
4. The pressure transducer test apparatus of claim 1 wherein the valve can be opened or closed remotely.
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5. A pressure transducer test apparatus comprising:
a fitting having an input to receive a pressure input and an output coupleable to a pressure transducer;
a valve attached to the fitting near the input; and
a piston provided in the fitting, wherein the piston can be remotely moved between first and second positions, such that the fitting has a first internal volume between the valve and the output when the piston is in the first position, and the fitting has a second internal volume between the valve and the output when the piston is in the second position.
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6. The pressure transducer test apparatus of claim 5 wherein the piston is moved in response to an electro magnet.

7. The pressure transducer test apparatus of claim 5 wherein the valve can be opened or closed remotely.

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8. The pressure transducer test apparatus of claim 5 wherein the fitting comprises:
a primary tube having first and second opposite ends; and
a secondary tube attached to the primary tube between the first and second ends, wherein the secondary tube contains the piston.

9. The pressure transducer test apparatus of claim 8 wherein the secondary tube is attached generally perpendicular the primary tube.

10. The pressure transducer test apparatus of claim 8 wherein the primary and secondary tubes have a non-circular cross-sections.

FIG. 10

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11. A method of in situ testing a pressure transducer comprising:
measuring a first internal pressure in a fitting using the pressure transducer;
changing an internal volume of the fitting to change the internal pressure;
measuring a second internal pressure in the fitting using the pressure transducer;
and
comparing the measured first and second internal pressures to historical pressure readings.

12. The method of claim 11 wherein changing the volume of the fitting comprises moving a piston located within the fitting.

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13. The method of claim 11 further comprises sealing an input of the fitting prior to measuring the first internal pressure.

14. The method of claim 11 further comprising calculating a sensitivity, repeatability and hysteresis of the transducer using the measured internal pressures.

15. The method of claim 14 further comprising calculating linearity of the transducer using the measured internal pressures and a measured temperature.

16. A method of health checking a calibrated transducer comprising:
recording a sensitivity of the transducer during calibration;
recording a linearity of the transducer during calibration;
recording a hysteresis of the transducer during calibration;
recording repeatability of the transducer during calibration;
checking the sensitivity of the transducer in the operation environment;
checking the linearity of the transducer in the operation environment;
checking the hysteresis of the transducer in the operation environment;
checking the repeatability of the transducer in the operation environment; and
comparing the recorded values of the transducer with the checked values of the transducer to determine the health of the transducer.

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17. The method of claim 16 wherein checking the sensitivity, linearity, hysteresis, and repeatability are checked by measuring pressure on the transducer when the pressure is remotely changed using a test apparatus.

18. The method of claim 16 wherein the test apparatus includes a fitting with a piston, wherein moving the piston can change an internal volume of the fitting.

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19. A method of in situ testing a pressure transducer comprising:

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measuring a series of first internal pressures in a fitting using the pressure transducer, wherein the fitting has a pressure chamber in a first volume state;

measuring a series of second internal pressures in a fitting using the pressure transducer, wherein the pressure chamber is in a second volume state;

and

analyzing and comparing the measured series of first and second internal pressures to historical data.

20. The method of claim 19 analyzing comprises determining sensitivity, linearity, hysteresis, or repeatability of the transducer.

21. The method of claim 19 wherein the first and second volume states of the pressure chamber are determined by a position of an internal piston of the fitting.

22. A method of in situ testing a pressure transducer comprising:

measuring a series of first internal pressures in a fitting using the pressure transducer, wherein the fitting has a pressure chamber in a first volume state;

measuring a series of second internal pressures in a fitting using the pressure transducer, wherein the pressure chamber is in a second volume state;

analyzing and comparing the measured series of first and second internal pressures to historical data; and

using a temperature transducer, measuring a temperature of the enclosed gas while measuring the series of first and second internal pressures and making comparisons to laboratory data for the same gases and apparatus.

23. The method of claim 22 comprising determining a quantity of gas in the entrapped volume assuming both the temperature and pressure transducers are functioning properly.

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24. The method of claim 23 wherein an absolute reading of the pressure transducer is compared with an estimate based on the gas quantity and an equation of state of the gas.

25. The method of claim 22 further comprises calculating an offset error between the pressure transducer reading and an expected reading.

26. The method of claim 22 wherein a reliability of the temperature and pressure measurements are assessed by further analysis of transient pressure and temperature data recorded during fitting actuation.

27. The method of claim 22 wherein a displayed or used reading of the pressure transducer is adjusted to account for offset.

FOOTNOTES